How to Detect and Confirm Epidemic Meningococcal Disease

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Detection and Confirmation of Epidemic Meningococcal Disease

1. **Maintain surveillance**
   - Health facilities report suspected cases of meningitis weekly
   - Districts monitor weekly attack rate of meningitis
   - Intensify surveillance in dry season

2. **Obtain laboratory confirmation**
   - Inspect CSF for turbidity
   - CSF to the laboratory for antigen detection and / or culture

3. **Investigate suspected epidemics**

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Purposes of Surveillance

- Detect outbreaks early
- Estimate number of cases and deaths
- Assess size and geographic extent of outbreak
- Plan vaccination campaign
- Decide whether control measures are working

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Monitor Weekly Meningitis Attack Rates to Detect an Epidemic

- Endemic meningitis is caused by a variety of agents (e.g. *Hemophilus influenzae* type b, *Streptococcus pneumoniae*)
  - these agents do not cause epidemics
- A large increase in meningitis cases is almost certainly due to *N. meningitidis*
  - meningococcal septicemia is less common and harder to recognize
- An attack rate above 15 / 100,000 / week for 2 weeks predicts a large epidemic of meningococcal disease

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Case Definitions for Bacterial Meningitis (& meningococcal septicemia)

- **Suspected**
- **Probable**
- **Confirmed**

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Suspected

Sudden onset of fever

WITH stiff neck

AND / OR petechial or purpural rash

In patients under one year of age, a suspected case of meningitis occurs when fever is accompanied by a bulging fontanelle.

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Probable

Suspected Case

WITH turbid CSF (with or without positive Gram stain)

OR ongoing epidemic

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Confirmed

Suspected or probable case

AND: EITHER

- positive CSF antigen detection

  OR

- positive culture

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Collect Information About Cases

- **Record basic information in register**
  - date, name, age, sex, address
  - diagnosis & method of confirmation of Dx
    - clinical? CSF? other lab investigations?
    - describe CSF, if lumbar puncture done
  - treatment
  - outcome (lived, died, referred)
- **Consider a separate "epidemic register" during an epidemic**

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Reporting Cases

- Health facilities should report meningitis cases every week
  - suspected, probable and confirmed cases
- Districts summarize and forward reports
- Send reports by rapid and reliable means
- Reports of suspected *epidemics* should be investigated

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Definition of an Epidemic of Meningococcal Disease

- Epidemic is defined as: *an attack rate substantially above the usual rate of disease*

- The attack rate (AR) is the number of cases in a given area, in a given time
  - expressed as "per 100,000 population"

- When the attack rate exceeds 15 cases / 100,000 population per week for two weeks, a large epidemic is likely

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Weekly Attack Rate Threshold

- Health officials can use the threshold attack rates to predict epidemics
- Threshold rate is best applied to populations of 30,000 to 100,000 persons
- The threshold is:
  - low enough to detect an epidemic early, so that vaccination will have a substantial impact
  - high enough to avoid frequent false alarms

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Primary Threshold Attack Rate

The primary threshold attack rate is 15 cases / 100,000 population / week

- When the primary threshold attack rate is exceeded for one week, a field investigation should be done
- When the primary threshold attack rate is exceeded for two weeks, a large epidemic is likely to occur
- When the primary threshold attack rate is exceeded for two weeks and there is laboratory confirmation of meningococcal disease - begin mass vaccination.

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Secondary Threshold Attack Rate

The secondary threshold attack rate is 5 cases / 100,000 population / week

- used in areas that are adjacent to areas in which there is a confirmed epidemic of meningococcal disease
- when the secondary attack rate is exceeded for one week, begin mass vaccination

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Threshold Attack Rates

Summary

- **INVESTIGATE** when AR exceeds 15 cases / 100,000 per week for any one week

- **VACCINATE** when AR exceeds 15 cases / 100,000 per week for two weeks in a row and there is laboratory confirmation of meningococcal disease

- **VACCINATE** when the AR exceeds 5 cases / 100,000 for 1 week in areas adjacent to those with a confirmed epidemic

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Calculate the Attack Rate

- **Step 1: Divide 100,000 by the population**
  - population should be between 30,000-100,000
  - may round to nearest 1,000
- **Step 2: Multiply result of Step 1 by the number of cases reported in a given week**
- The result is the attack rate for the week
  - Compare it to the threshold rates

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Calculate Attack Rate

Example

The population of Nolo District is 50,000. Forty cases of meningitis were reported this week.

- **Step 1: Divide 100,000 by the population**

$$\frac{100{,}000}{50{,}000} = 2$$

- **Step 2: Multiply result by # of cases**

2 X 40 = 80. The attack rate is 80 cases / 100,000 population

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Detect Epidemics Using Threshold Number of Cases

- Alternate method for detecting epidemics
- Compares *numbers*, not *rates*
- May be used by districts with stable populations between 30,000-100,000
- Does not require weekly calculations
- Determine and monitor number of cases that is equivalent to the threshold attack rate

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Calculate Primary Threshold Number

Step 1: Multiply the population by 15

Step 2: Divide the result by 100,000

Step 3: Round result to nearest integer

The result is the primary threshold number

- equivalent to attack rate of 15 cases / 100,000

The "secondary threshold" number is
1/3 of the primary threshold number

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Calculate Primary Threshold Number

Bona District Example

Bona district population is 63,270 (round to 63,000).

Step 1: Multiply the population by 15

63,000 X 15 = 945,000

Step 2: Divide the result by 100,000

$$\frac{945{,}000}{100{,}000} = 9.45$$

Step 3: Round result to nearest integer

9.45 rounds down to 9

The primary threshold number is 9 cases/week

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Using the Threshold Number

Bona District Example cont.

Bona District health staff now know that when:

- there are more than 9 cases in any week, they should conduct a field investigation
- there are more than 9 cases / week for 2 consecutive weeks and there is laboratory confirmation, they should begin rapid mass vaccination
- there is an confirmed epidemic in a neighboring area, Bona district should begin vaccination when more than 3 cases / week occur in their own district

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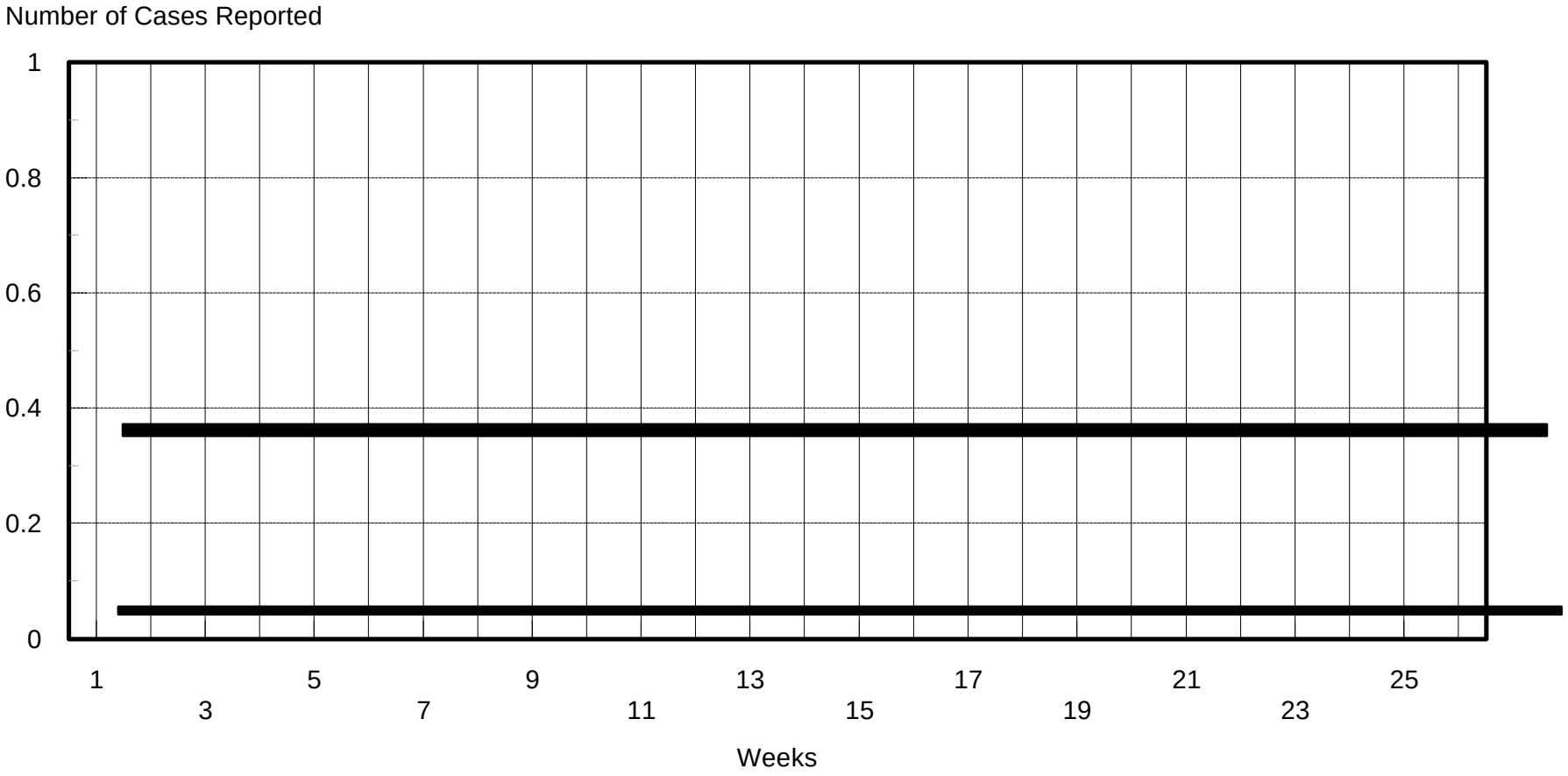
Weekly Meningitis Cases
Bona District - 63,270 population



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Calculate Secondary Threshold Number

Step 1: Multiply the population by 5

Step 2: Divide the result by 100,000

Step 3: Round result to nearest integer

The result is the secondary threshold number

- equivalent to attack rate of 5 cases / 100,000
- use in areas adjacent to confirmed epidemics

The "secondary threshold" number is 1/3 of the primary threshold number

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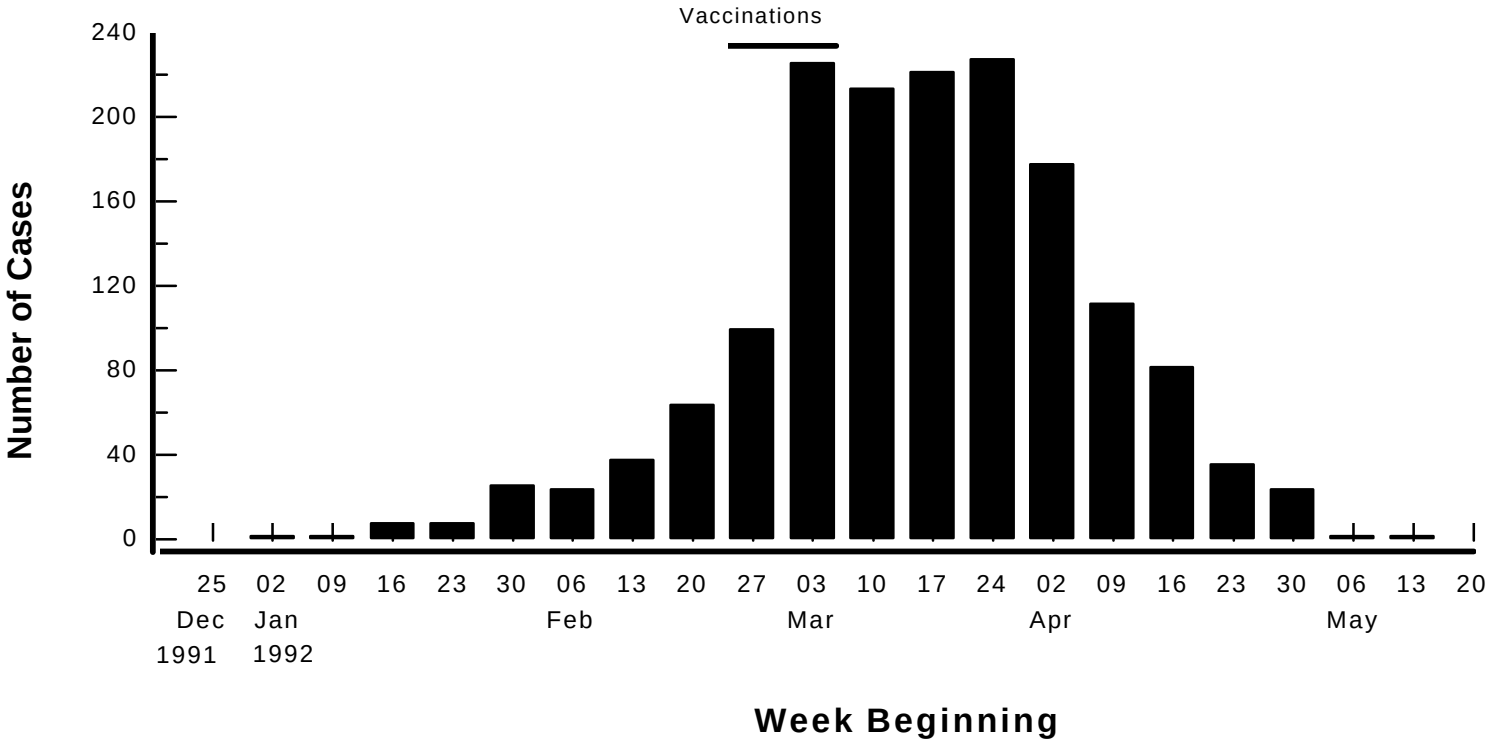
Weekly Meningitis Cases During an Epidemic

Meningitis Cases by Week

Tokombere Subdivision (pop. 74,000)
Far North Province, Cameroon



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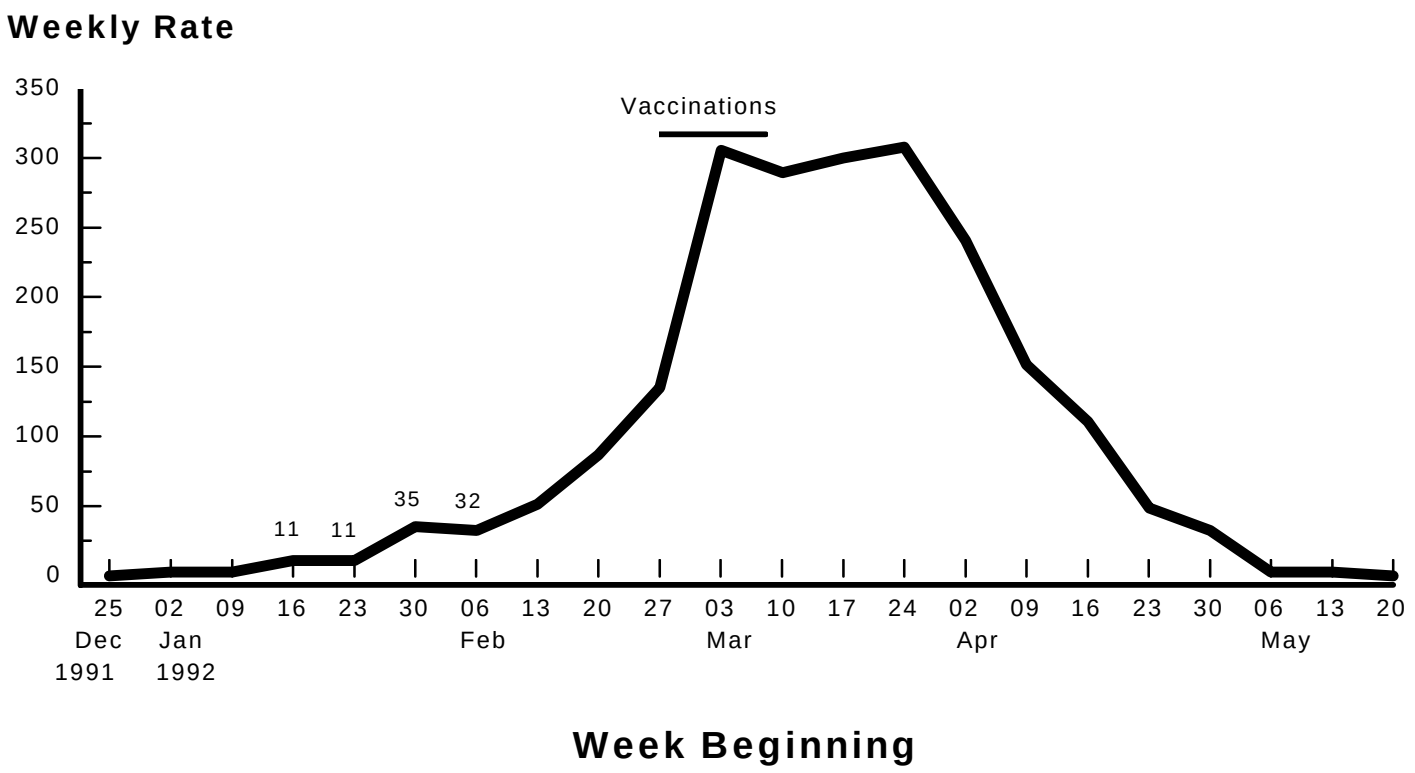
Weekly Meningitis Rates During an Epidemic



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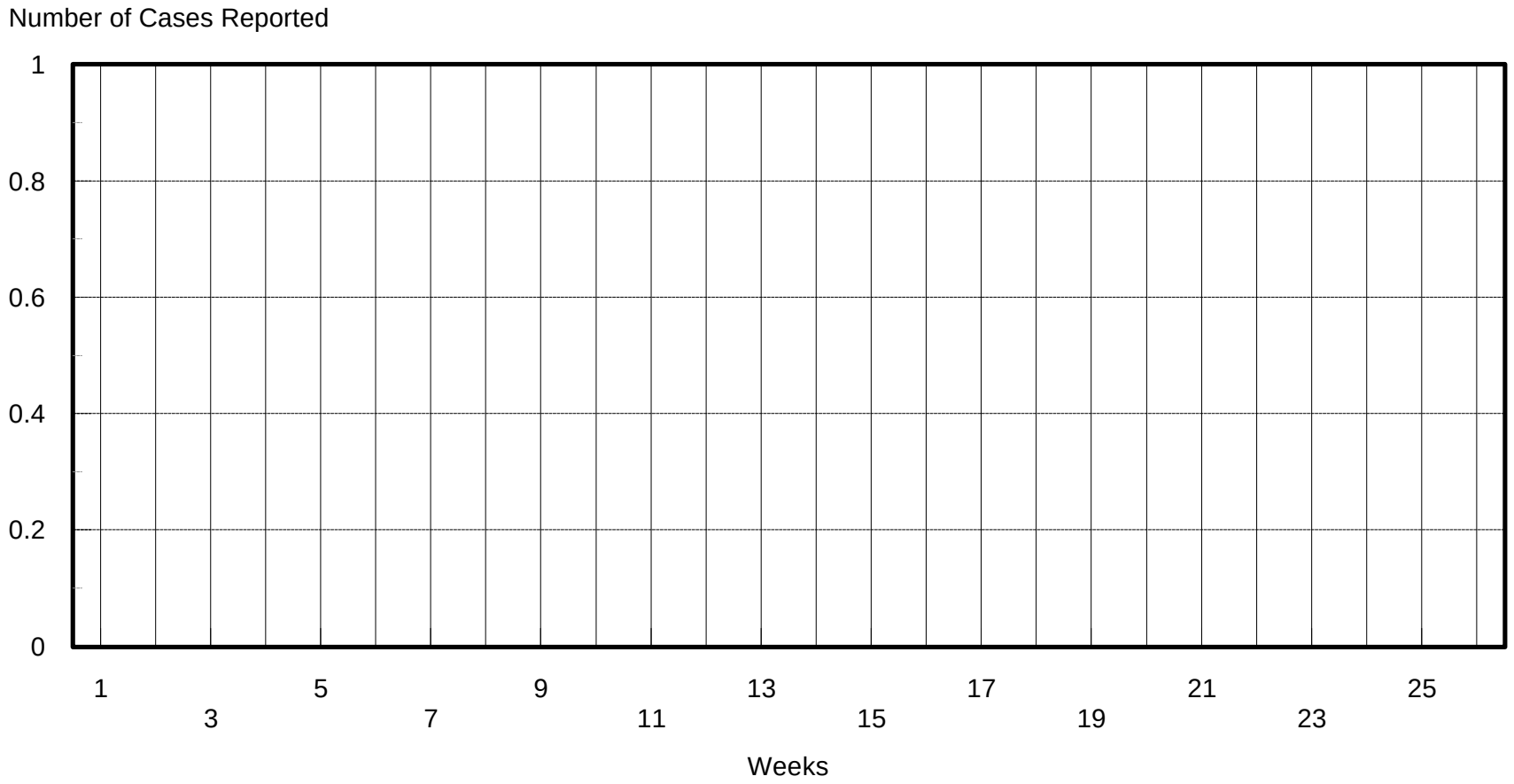
Weekly Meningitis Cases

Population _____



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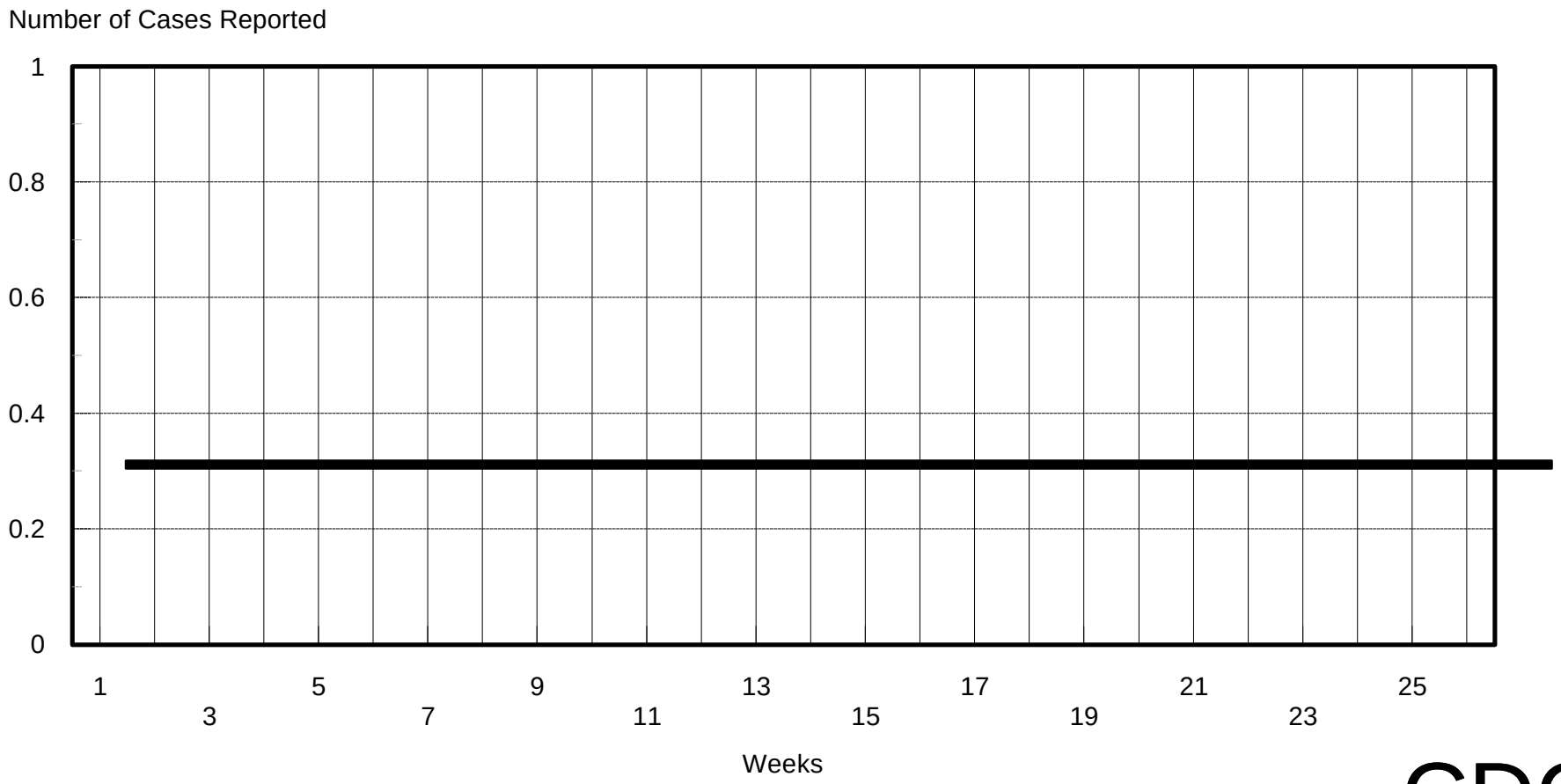
Weekly Meningitis Cases
Lit District - Population 32,600



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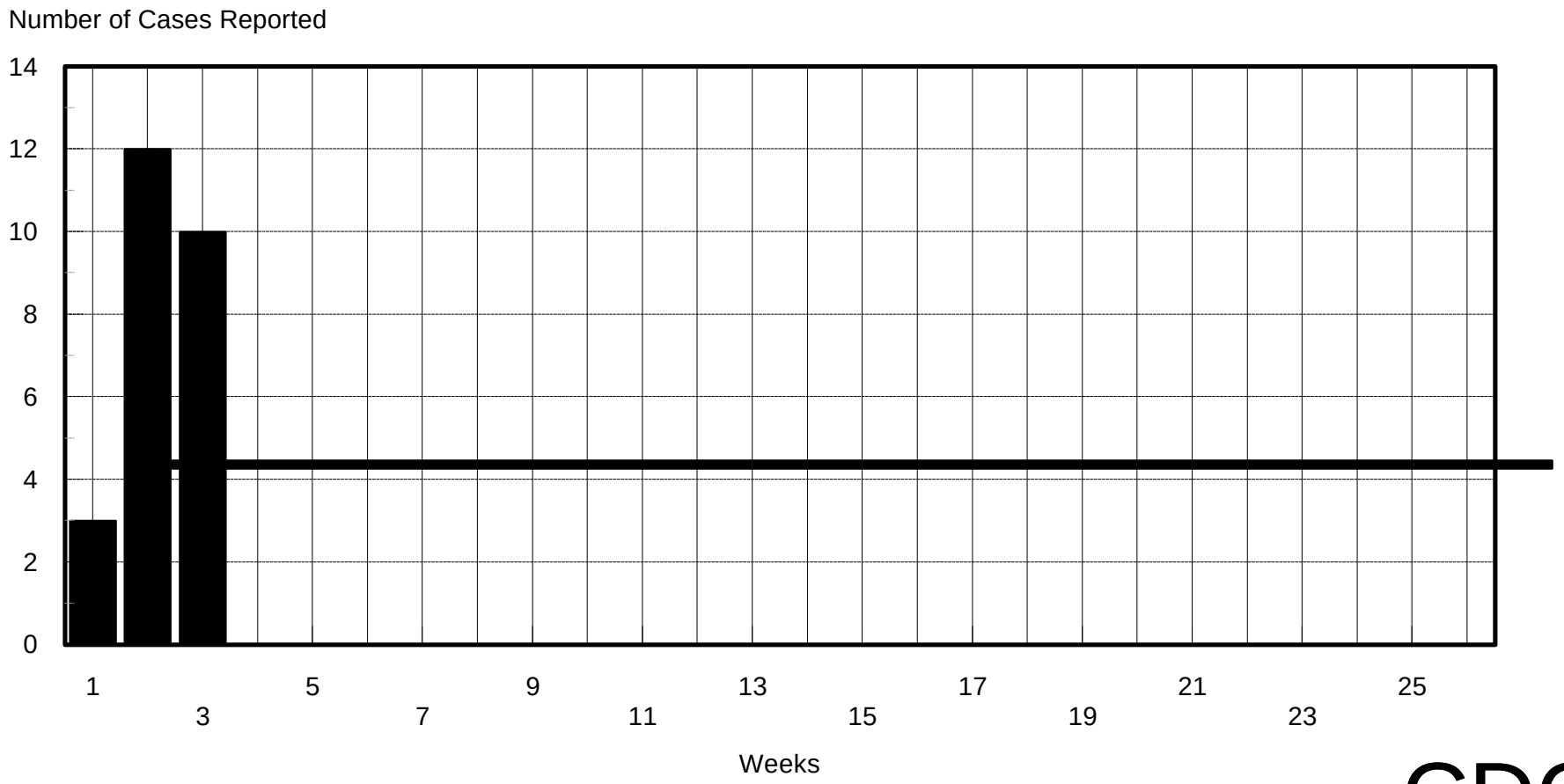
Weekly Meningitis Cases
Lit District - Population 32,600



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Know Your Threshold

- **Method 1** - Monitor the attack rate
  - calculate ***attack rates*** every week
- **Method 2 -** Monitor the number of cases
  - Determine the number of cases that corresponds to the AR of 15 cases / 100,000 (depends on your population)
  - Every week, compare that number to the number of cases that occurred

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Detection and Confirmation

Summary

1. **Maintain surveillance**
   - Health facilities report suspected cases of meningitis weekly
   - Districts monitor weekly attack rate of meningitis and compare rate to threshold rate

     or
   - Districts compare number of weekly cases to the pre-determined threshold number

2. **Obtain laboratory confirmation**

3. **Investigate suspected epidemics**

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